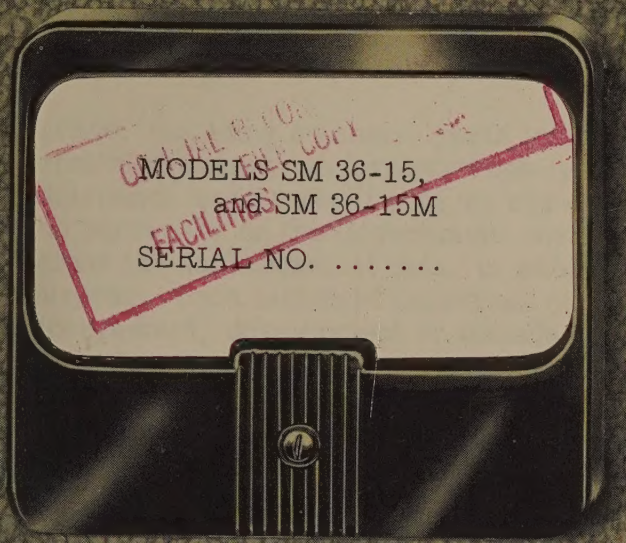
Kepco

INSTRUCTION MANUAL



VOLTAGE REGULATED POWER SUPPLIES

Kepco Inc.

INSTRUCTION MANUAL:

ORIGINAL RETAINED
FACILITIES COPY

MODELS SM 36-15,
and SM 36-15M
SERIAL NO. .....

KEPCO, INC.
131 - 38 Sanford Avenue
Flushing 52, New York

QC CAL/CERT
PROCEDURES
GROUP COPY

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Flushing, New York

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SECTION A SPECIFICATIONS AND CONTROLS

I. ELECTRICAL AND PHYSICAL SPECIFICATIONS:

.....DC OUTPUT VOLTAGE:
0-36 volts DC, continuously variable.

.....DC OUTPUT CURRENT:
0-15 amperes, continuous duty.

.....AC INPUT:
105-125 volts, 60 ± 1/2 cps, 10.5 amperes (max.), 1100 watts (max.).

.....REGULATION: (See "remote error sensing" under "II. Terminals and Controls.")

Line: Less than 0.1% for 105-125 volts AC line fluctuations at any output voltage in the specified range.

Load: Less than 0.1% or 0.003 volt, whichever is greater, for 0-15 ampere step load change, at any output voltage in the specified range.

.....RIPPLE:
Less than 0.001 volt rms.

.....STABILITY:
Output voltage variation is less than 0.1% or 0.006 volt, whichever is greater, over a period of 8 hours after unit has reached equilibrium. Approximately 3/4 of an hour is required for this unit to reach equilibrium from a "cold start".

.....OUTPUT IMPEDANCE:
Less than 0.005 ohm from 60 cps to 1 KC.
Less than 0.05 ohm from 1 KC to 100 KC.

.....RECOVERY TIME:
50 microseconds.

.....TEMPERATURE COEFFICIENT:
Output voltage changes less than 0.05% per °C.

.....AMBIENT OPERATING TEMPERATURE:
-20°C to +50°C maximum. Protective circuit turns off unit whenever over-temperature condition occurs in pass elements. Interrupting input power resets unit.

.....STORAGE TEMPERATURE:
-40°C to +85°C.

....DIMENSIONS:
8-3/4" high x 19" wide x 13-7/8" deep (behind panel).

....COLOR:
Kepco Standard Gray Hammertone.

....METERS (If specified):
Voltmeter: 0-50 volts, 2-1/2".
Ammeter: 0-15 amps, 2-1/2".

II. TERMINALS AND CONTROLS:

....(On front panel):

....DC OUTPUT AND GROUND binding posts, clearly marked. Output terminals isolated from chassis; either positive or negative terminal may be grounded.
....VOLTAGE CONTROL, continuously variable, for setting the desired output voltage.
....POWER ON-OFF toggle switch.

....(At rear of unit):

....DC OUTPUT AND GROUND binding posts, clearly marked; either positive or negative terminal may be grounded.
....REMOTE ERROR SENSING binding posts provide means of maintaining specified regulation directly at the load by compensating for voltage drops across load supply leads for up to 0.5 volt per lead (maximum). (See Diagram and Procedure on Page C-1.)

III. PROTECTIVE FEATURES:

....REFERENCE FUSE for input to the auxiliary supplies. Pilot light goes out if fuse blows; fan stops.
....POWER FUSE for line power input. Pilot light goes out if fuse blows; fan stops.
....DC FUSE for main supply. Pilot light remains on if fuse blows; fan remains operative.

...OVERLOAD PROTECTION:
Provided by inherent current limiting action of FLUX-O-TRAN. Output may be shorted momentarily without damage to unit. Continuous overload or short will blow DC FUSE.

...OVER-TEMPERATURE PROTECTION:
Thermostat relay control turns unit off if temperature of pass elements exceeds safe limit. Unit must be reset by interrupting input power with ON-OFF toggle switch on front panel or by disconnecting line cord from power source.

SECTION B

BRIEF THEORY:

Two circuit schematic drawings titled "POWER UNIT" and "CONTROL UNIT" are included in the Reference Index of this instruction manual. These drawings contain designations corresponding to the capitalized terms in the following discussion.

Some basic functional relationships in this power supply are illustrated in block Diagram B-1 (Page B-2A).

The POWER UNIT includes:

DC SOURCES:

.....MAIN SUPPLY - (consisting of a Kepco "Flux-O-Tran" transformer, full wave bridge rectifier, and capacitive filter) provides line regulated DC power for the output, via the PASS CIRCUITRY.

.....AUXILIARY SUPPLIES: COLLECTOR SUPPLY (negative full wave rectified) for PASS CIRCUITRY driver stages not connected to MAIN SUPPLY; I_{CO} SUPPLY (full wave rectified) compensates for spurious biasing effects of collector leakage current; RETURN SUPPLY (full wave rectified) acts as leakage current path for series pass transistors and as bleed path to provide minimum operating current for pass transistors; CONTROL UNIT SUPPLY (full wave rectified).

PASS CIRCUITRY:

The power transistors which function as pass elements (i.e. are in series with the load) may be regarded effectively as variable resistors (or conductors) controlled by a CONTROL SIGNAL. The current "passed" by these elements is a function of the emitter-base bias. The CONTROL SIGNAL is applied to the base terminal; hence a negative CONTROL SIGNAL will aid the forward conduction of a PNP transistor while a positive CONTROL SIGNAL will reduce the forward conduction. In response to the CONTROL SIGNAL the pass elements effect a current and voltage distribution in the main DC loop which holds the output voltage constant.

The CONTROL UNIT includes:

REFERENCE CIRCUITRY:

The function of the REFERENCE CIRCUITRY is to maintain a precise, stable, voltage standard for the COMPARISON AMPLIFIER.

COMPARISON AMPLIFIER:

The COMPARISON AMPLIFIER is essentially a series of cascaded transistor amplifiers which boost the differential error signal produced in the COMPARISON BRIDGE to a level sufficient to drive the PASS CIRCUITRY. The COMPARISON AMPLIFIER is connected across the COMPARISON BRIDGE from the junction of the VOLTAGE CONTROL and the REFERENCE RESISTANCE to the junction of the REFERENCE DIODE and the negative output terminal (See Diagram on Page B-2A). This arrangement is similar to that of a null galvanometer across a Wheatstone bridge. Unbalance in the COMPARISON BRIDGE is amplified to produce a CONTROL SIGNAL of suitable magnitude and phase to effect corrective action by the PASS CIRCUITRY.

COMPARISON BRIDGE: (See Diagram B-2, Page B-2A).

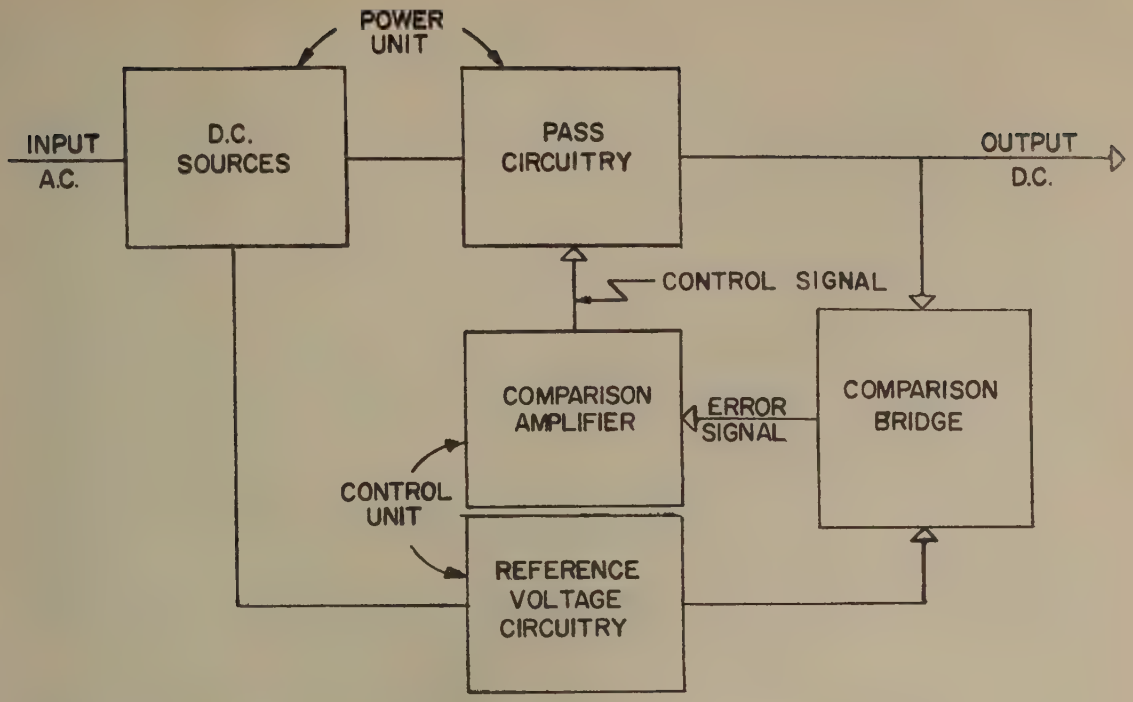
This bridge circuit implements the comparison between the OUTPUT VOLTAGE and the REFERENCE VOLTAGE. The signal produced by the comparison drives the COMPARISON AMPLIFIER.

Balance occurs in the Comparison Bridge when the following ratios are equal:

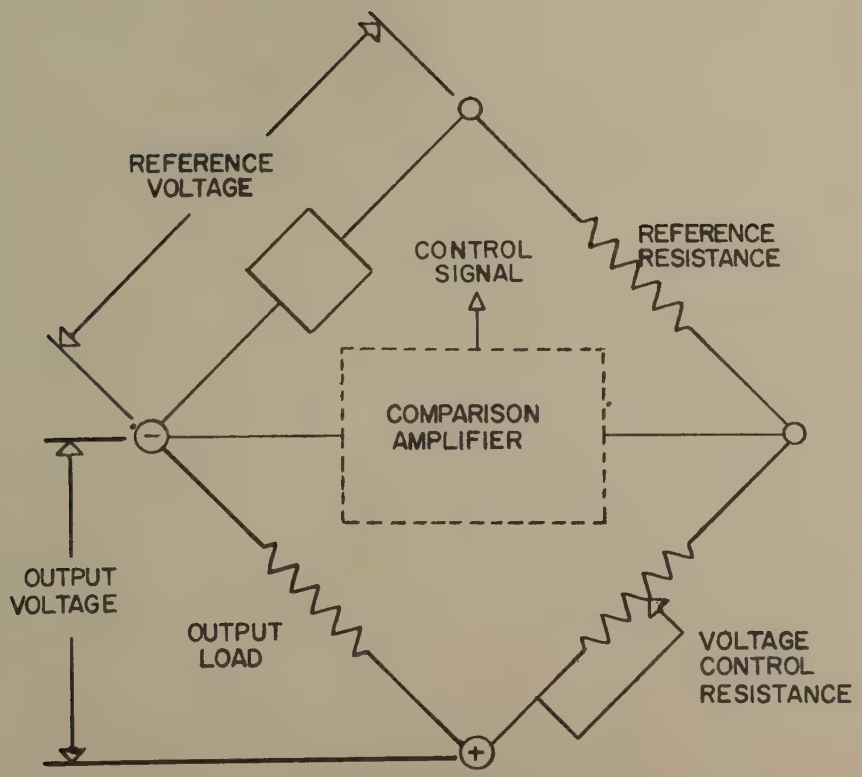
$$\frac{\text{Output Voltage}}{\text{Voltage Control Resistance}} = \frac{\text{Reference Voltage}}{\text{Reference Resistance}}$$

When, for example, the Comparison Bridge is unbalanced by a decreasing output voltage drop across the load, it gives rise to a negative signal at the base of the COMPARISON FOLLOWER in the COMPARISON AMPLIFIER circuit. This signal is amplified in cascade and communicated to the pass elements as a negative base input aiding their forward conduction and consequently increasing the output voltage.

A bridge unbalance caused by an increasing output voltage produces, of course, a chain of oppositely biased circuit responses which reduce the voltage across the load.



(DIAGRAM B-1) *VOLTAGE REGULATED POWER SUPPLY*



(DIAGRAM B-2) *COMPARISON BRIDGE*

THIS POWER SUPPLY:

....is shipped without any internal packing material and may be put into operation right away.

....is designed for rack or bench use. Carrying handles are provided on front panel.

....requires no mechanical maintenance of any kind, under normal operating conditions.

....incorporates carefully selected and tested components which assure long trouble free operating life. However, resistor board construction and plug-in sub-assemblies provide exceptional component accessibility should servicing be required. Any servicing should be handled by personnel experienced in transistor circuitry. Serious and costly damage can result from inexperienced probing.

....should not be returned to the factory without proper authorization and shipping instructions. In any correspondence with the factory concerning repair, the model and serial number of the instrument must be supplied together with a description of the trouble encountered.

INITIAL "TURN-ON" PROCEDURE:

1. Rotate voltage control to approximate mid-range position.

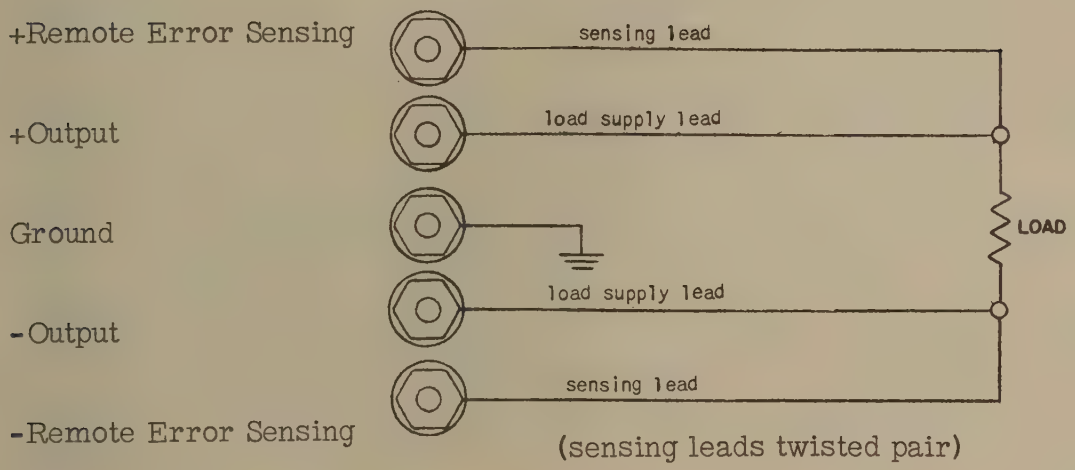
2. With power ON-OFF switch in "OFF" position, plug line cord into 115 VAC 60 cps power receptacle. If the outlet is not polarized, use 3 to 2 prong adaptor supplied with unit.

3. Turn power ON-OFF switch to "ON" position.

4. Set output voltage to desired value by rotating voltage control.

REMOTE ERROR SENSING OPERATION

(Terminal Connections)



(Procedure)

1. With AC input power disconnected, remove jumpers between plus and minus Output terminals and Remote Error Sensing terminals on the rear of the unit.

2. Using twisted pair wire, connect sensing leads from positive and negative Remote Error Sensing terminals to the load (observing polarities).

3. Using twisted pair wire, connect load supply leads from positive and negative Output terminals.

IMPORTANT NOTE: This unit should not be operated with Remote Error Sensing if the voltage drop across the load supply leads exceeds 0.5 volt (maximum) per lead at maximum rated output current.

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
B201	149-0013	Fan, Venturi		Rotron	Muffin Fan
		Capacitors:			
C201	117-0294	Electrolytic, Can Type	21 k µf 57.5 v	Sangamo	DCM
C202, 203	117-0242	Electrolytic, Can Type	10.5 k µf 65 v +100, -10%	Industrial Cond.	1B1211
C204	117-0280	Paper, Can Type	8 µf 660 v AC 6%	Industrial Cond.	2465-SVR
C206	117-0129	Mylar	2 µf 200 v 10%	Hopkins Eng.	1P2M
C207	117-0068	Mylar	0.1 µf 600 v 20%	Good-All	620S10406W
C301	117-0291	Mylar	.03 µf 200 v 10%	Good-All	620S22402W
C302	117-0147	Electrolytic, Pigtail Type	10 µf 150 v + 50, -10%	Industrial Cond.	10B912RM
C303	117-0114	Electrolytic, Pigtail Type	350 µf 50 v + 50, -10%	Industrial Cond.	50RM350
C401	117-0114	Electrolytic, Pigtail Type	350 µf 50 v +100, -10%	Industrial Cond.	1B844
C402	117-0222	Electrolytic, Pigtail Type	100 µf 200 v + 50, -10%	Industrial Cond.	20B317RM
C403, 404	117-0221	Electrolytic, Pigtail Type	500 µf 50 v +100, -10%	Industrial Cond.	1B1163RM
C405, 406	117-0163	Ceramic	0.05 µf 500 v 20%	Sprague	36C142A1
		Rectifiers:			
CR201	124-0089	Silicon, Stack Type		Trans-Sil	2R1137
CR301, 302	124-0028	Silicon, Pigtail Type		Automatic	PT-5
CR401, 402 405, 408	124-0084	Silicon, Pigtail Type		Transitron	SL-91
CR403, 404	124-0028	Silicon, Pigtail Type		Automatic	PT-5

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
F101	141-0010	Fuse, Instantaneous	15 a 250 v	Bussmann	ABC-15
F102	141-0038	Fuse, Slow Blow	20 a 32 v	Bussmann	MDL-20
F401	141-0012	Fuse, Instantaneous	2 a 250 v	Bussmann	AGC-2
M101	135-0138	Meter*	50 v DC 2-1/2"	Gen. Electric	8DW91V201AR2
M102	135-0141	Meter*	15 a DC 2-1/2"	Gen. Electric	8DW91A230BX2
		*(appl. only to Model SM 36-15M)			
PL101	153-0024	Pilot Light		Gen. Electric	NE-51
Q301	119-0022	Transistor, PNP		Tung-Sol	2N382
Q302	119-0034	Transistor, PNP		Delco	2N1172
		Resistors:			
R201	115-0513	Fixed, Power, Strip	1 K ohms 40 w 5%	Ward Leonard	40S1000
R202	115-0690	Fixed, Power, Strip	1 ohms 20 w 5%	Ward Leonard	20S1WL
R203	115-0909	Fixed, Power, Strip	5 ohms 30 w 5%	Ward Leonard	30S5
R204	115-0551	Fixed, Power, Strip	500 ohms 20 w 5%	Ward Leonard	20S500WL
R205	115-0577	Fixed, Power, Strip	150 ohms 20 w 5%	Ward Leonard	20S150WL
R206-208	115-1014	Fixed, Power, Ribbon	0.1 ohms 40 w 5%	Hardwick Hindle	HH2B-35-0.1 ohm-5%
R209	115-0896	Variable, Wire Wound	5 K ohms 2.5 w 5%	General Radio	973-M
R210, 211	115-0718	Fixed, Molded	47 ohms 1/2 w 10%	Allen Bradley	EB4701
R301	115-0421	Fixed, Power, Axial	10 ohms 3 w 5%	Ward Leonard	3X10WL
R302	115-0904	Fixed, Molded	68 ohms 1/2 w 5%	Allen-Bradley	EB6805

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
		Resistors:			
R303	115-0808	Fixed, Molded	3.9 K ohms 1/2 w 5%	Allen-Bradley	EB3925
R304	115-0900	Fixed, Molded	1.2 K ohms 1 w 5%	Allen-Bradley	GB1225
R305	115-0905	Fixed, Power, Axial	200 ohms 5 w 5%	Ward Leonard	5X200
R306	115-0341	Fixed, Molded	100 ohms 1/2 w 5%	Allen-Bradley	EB5605
R307	115-0253	Fixed, Molded	82 K ohms 1/2 w 5%	Allen-Bradley	EB8235
R308	115-0512	Fixed, Power, Axial	1 K ohms 5 w 5%	Ward Leonard	5X1000WL
R309	115-0809	Fixed, Molded	100 K 1/2 w 10%	Allen-Bradley	EB1041
RL201	140-0040	Relay, Plug-In Type		Kurman	26D3C
S101	127-0107	Switch, Toggle	SPST	Carling	AA252-71-2
T201	100-1180	Transformer, Flux-O-Tran		Kepco Magnetics	100-1180
T202	175-0397	Transformer, Variable		Ohmite	VT8LN
T401	100-1179	Transformer		Kepco Magnetics	100-1179
A0/441-10	110-0114	PASS ASSEMBLY (STAT)			
		Includes the following:			
1 ea.	119-0016	Transistor, PNP		Delco	2N441-10
2C0.2/SP67	110-0118	PASS ASSEMBLY (STAT)			
		Includes the following:			
2 ea.	115-0891	Resistor, Fixed, Power, Axial	0.2 ohms 5 w 5%	Ward Leonard	7/8"-Y-O.2-Axiohm-5%
2 ea.	119-0035	Transistor, PNP		Motorola	SP67*

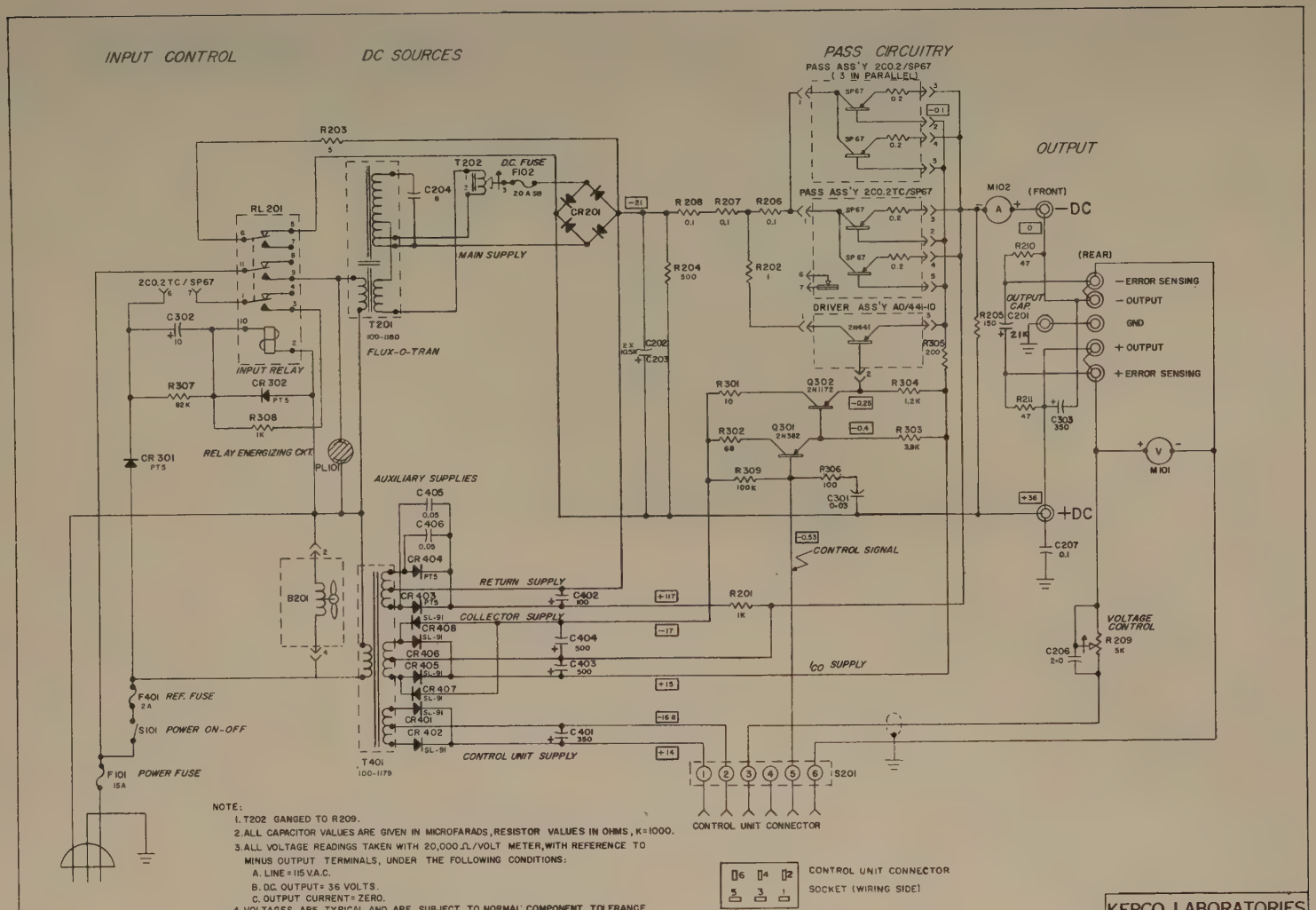
*Field Replacement: Motorola 2N1163

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
2C0.2TC/SP67		PASS ASSEMBLY (STAT)			
	110-0120				
		Includes the following:			
2 ea.	115-0891	Resistor, Fixed, Power, Axial	0.2 ohms 5 w 5%	Ward Leonard	7/8"-Y-0.2-Axiohm-5%
1 ea.	127-0093	Switch, Thermostat	N.C.	Chatham	DRSCORP73C
2 ea.	119-0035	Transistor, PNP		Motorola	SP67*

*Field Replacement: Motorola 2N1163

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
		Capacitors:			
C1	117-0107	Mylar	0.22 µf 200v 20%	Good-All	620S22402W
C2	117-0087	Ceramic	0.1 µf 500v +80,-20%	Sprague	41C92
C3	117-0105	Electrolytic, Pigtail Type	25 µf 25v +100,-10%	Industrial Cond.	52RM25
C4	117-0128	Mylar	0.4 µf 200v 10%	Hopkins Eng.	P42M
CR1, 2	124-0084	Rectifier, Silicon, Pigtail Type		Transitron	SL-91
Q1, 4, 5	119-0024	Transistor, NPN		Gen. Transistor	GT1092
Q2	119-0022	Transistor, PNP		Tung-Sol	2N382
Q3	119-0007	Transistor, NPN		Gen. Transistor	2N35
Q6	119-0034	Transistor, PNP		Delco	2N1172
		Resistors:			
R1	115-0002	Fixed, Molded	100 ohm 1 w 10%	Allen-Bradley	GB1011
R2	115-0502	Fixed, Molded	10 ohm 1/2 w 10%	Allen-Bradley	EB1001
R3	115-0467	Fixed, Molded	4.7 K ohm 1/2 w 10%	Allen-Bradley	EB4721
R4	115-0484	Fixed, Molded	240 ohm 1/2 w 5%	Allen-Bradley	EB2415
R5	115-0565	Fixed, Molded	620 ohm 1/2 w 5%	Allen-Bradley	EB6215
R6	115-0941	Fixed, Molded	82 ohm 1/2 w 10%	Allen-Bradley	EB8201
R7	115-0560	Fixed, Molded	2.7 K ohm 1/2 w 10%	Allen-Bradley	EB2721
R8	115-0808	Fixed, Molded	3.9 K ohm 1/2 w 5%	Allen-Bradley	EB3925
R9, 10	115-0459	Fixed, Power, Axial	500 ohm 3 w 5%	Ward Leonard	3X500
R11, 15	115-0888	Fixed, Molded	560 ohm 1/2 w 5%	Allen-Bradley	EB5615

Schematic Part No.	Kepco Part No.	Description	Specifications	Mfr.	Mfr's. No.
		Resistors:			
R12	115-0920	Fixed, Molded	13 K ohm 1/2 w 5%	Allen-Bradley	EB1335
R13	115-0473	Fixed, Molded	1.8 K ohm 1/2 w 10%	Allen-Bradley	EB1821
R14	115-0566	Fixed, Molded	750 ohm 1/2 w 5%	Allen-Bradley	EB7515
R16	115-0466	Fixed, Molded	2.2 K ohm 1/2 w 10%	Allen-Bradley	EB2221
R17	115-0005	Fixed, Molded	47 ohm 1 w 10%	Allen-Bradley	GB4701
R18	115-0052	Fixed, Molded	10 ohm 1 w 10%	Allen-Bradley	GB1001
R19	115-0739	Variable, Multiturn	1 K ohm 1/4 w 10%	Bourns	271-1-102
R20	115-0255	Fixed, Molded	56 K ohm 1/2 w 10%	Allen-Bradley	EB5631
RD1	121-0013	Reference Diode		Hoffman	RS-6



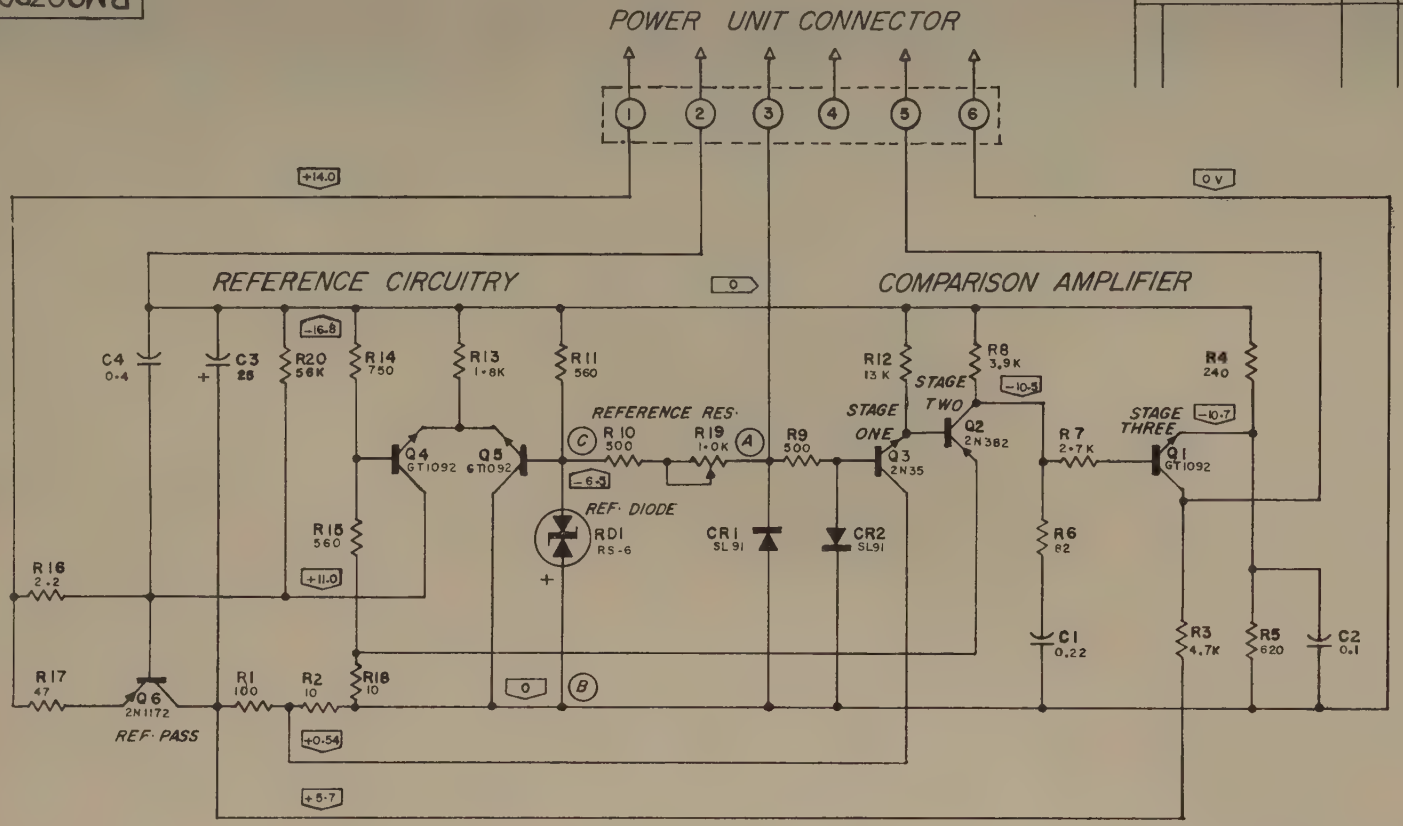
NOTE:

1. T202 GANGED TO R209.
2. ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS, RESISTOR VALUES IN OHMS, K=1000.
3. ALL VOLTAGE READINGS TAKEN WITH 20,000 Ω/VOLT METER, WITH REFERENCE TO MINUS OUTPUT TERMINALS, UNDER THE FOLLOWING CONDITIONS:
   A. LINE = 115 V.A.C.
   B. DC OUTPUT = 36 VOLTS.
   C. OUTPUT CURRENT = ZERO.
4. VOLTAGES ARE TYPICAL AND ARE SUBJECT TO NORMAL COMPONENT TOLERANCE.
5. METERS M101, M102 APPLY ONLY TO SM-36-15 M AND SM-36-15MX MODELS.

KEPCO LABORATORIES		
FLUSHING		NEW YORK
ITEM: POWER UNIT	DES. J.R.G.	
	APPD 3-6-61	
MODEL: SM-36-15M	DFTM J.O.K.	
DWG. No. C-M00293	CHKD JDK	

BM00790

REVISIONS	DRAWN	CHKD.	APPD.	DATE



NOTES:

1- ALL VOLTAGES TAKEN UNDER CONDITIONS SPECIFIED ON MAIN SCHEMATIC

2- ALL CAPACITOR VALUES ARE GIVEN IN MICROFARADS, RESISTOR VALUES IN OHMS, UNLESS OTHERWISE NOTED. (K= 1,000 OHMS)

TOLERANCE UNLESS OTHERWISE SPECIFIED: FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°

KEPCO INC.
FLUSHING, N.Y.

TITLE
CONTROL UNIT

DRAWN	CHECKED	APPROVED	DATE
C.A	J.F.K.		12-2-60
MODEL NO. TRAM 32		PART NO	SCALE

DWG. NO. BM00790

DEFIANCE NO. 1000H 39781

SYMPTOM		POSSIBLE CAUSES (in order of probability)		PHYSICAL LOCATION
I.	No Output Voltage A. Pilot light does not light, and fan does not rotate.	A. 1.	Unit is not plugged in.	
		2.	Blown POWER FUSE (F101).	Front panel
		3.	Blown REFERENCE FUSE (F401).	RB-2
		4.	Defective POWER SWITCH (S101).	Front panel
	B. Pilot light does not light, fan rotates.	B. 1.	THERMAL SWITCH located in pass assembly is defective, or open because of excessive temperature.	Chassis
		2.	Open electrolytic capacitor (C302).	RB-1
		3.	Open INPUT RELAY energizing coil	Chassis
	C. Pilot light turns on and fan rotates.	C. 1.	Blown D.C. fuse (F102). (Circuit breaker on appropriate units.)	Front panel
		2.	Defective ammeter (M102).	Front panel
		3.	Shorted output.	Rear
II.	Output Voltage Too High A. Voltage on Pin 5 of the control unit connector is positive with respect to the negative output terminal.	A. 1.	PASS ELEMENT shorted from collector to emitter. This can be checked with a VOM on the lowest resistance range by measuring the resistance from the minus output terminal to the negative side of the rectifier assembly. Less than 1 ohm resistance would indicate a probable short.	Chassis
		2.	Improper balance in COMPARISON BRIDGE. Adjust R18 counter-clockwise.	
		3.	PRE-DRIVER, DRIVER or PASS TRANSISTOR malfunction. Emitter to base voltages of pre-drivers Q301 and Q302 or driver are zero or negative. When functioning properly, these should be positive.	Chassis
	B. Voltage on Pin 5 of the control unit connector is negative with respect to the negative output terminal.	B. 1.	Transistor Q3 malfunction. Negative base to emitter bias indicates defective transistor or associated component.	Ctrl. unit (Tram)
		2.	Transistor Q1 malfunction. Positive, base to emitter bias indicates defective transistor or associated component.	Ctrl. unit (Tram)
		3.	Transistor Q2 malfunction. Negative base to emitter bias indicates defective transistor or associated component.	Ctrl. unit (Tram)
		4.	Blown POT fuse (F1).	Ctrl. unit (Tram)
		5.	Defective REFERENCE DIODE RD-1. Voltage across RD-1 should be approximately 6 volts, ±5% .	Ctrl. unit (Tram)
		6.	Open VOLTAGE CONTROL pot (R209).	Chassis
		7.	Open REFERENCE RESISTANCE (R18, R8).	Ctrl. unit (Tram)
		8.	Malfunction in reference diode power supply.	Ctrl. unit (Tram)
III.	Output Voltage Too Low A. Voltage on Pin 5 of control unit connector is negative with respect to the negative output terminal.	A. 1.	Partially shorted rectifier output or output terminals.	Chassis
		2.	PRE-DRIVER, DRIVER or PASS TRANSISTOR malfunction. Base to emitter voltages of pre-drivers Q301, Q302 or driver are zero or positive. For correct operation these should be negative.	Chassis
	B. Voltage on Pin 5 of control unit connector is positive with respect to the negative output terminal.	B. 1.	Transistor Q3 malfunction. Positive base to emitter bias indicates defective transistor or associated component.	Ctrl. unit (Tram)
		2.	Transistor Q1 malfunction. Negative base to emitter bias indicates defective transistor or associated component.	Ctrl. unit (Tram)
		3.	Transistor Q2 malfunction. Positive base to emitter bias indicates defective transistor or associated component.	Ctrl. unit (Tram)
		4.	Blown POT fuse (F1).	Ctrl. unit (Tram)
		5.	Defective REFERENCE DIODE RD-1. Voltage across RD-1 should be approximately 6 volts, ±5%.	Ctrl. unit (Tram)
		6.	Open VOLTAGE CONTROL pot (R209).	Chassis
		7.	Open REFERENCE RESISTANCE (R18, R8).	Ctrl. unit (Tram)
		8.	Malfunction in reference diode power supply.	Ctrl. unit (Tram)

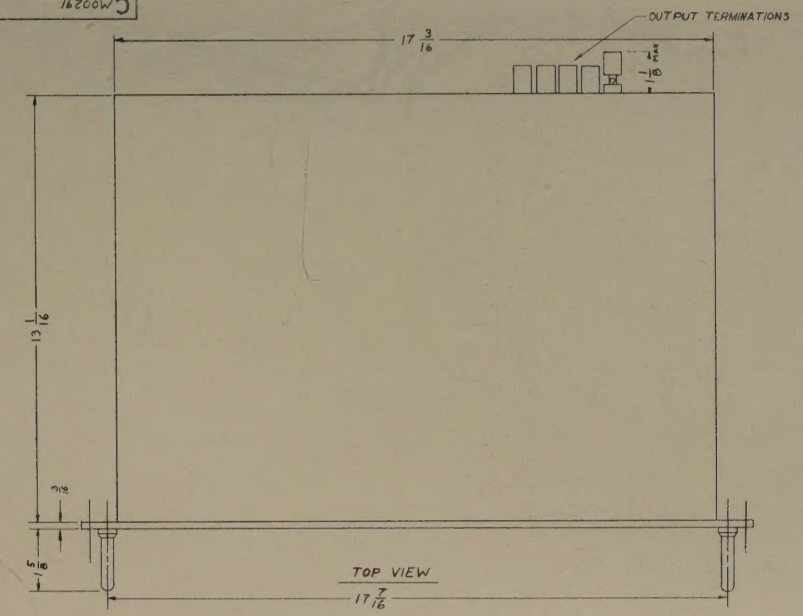
SYMPTOM	POSSIBLE CAUSES (in order of probability)	PHYSICAL LOCATION
IV. Output Voltage Can Not Be Set To Zero		
	1. Incorrectly adjusted resistor (R18). (See Notes.)	Ctrl. unit (Tram)
	2. PASS TRANSISTOR shorted from emitter to collector.	Chassis
V. Output Voltage Is Slightly Negative		
	1. Open main DC path. Continuity broken from output terminals to CR201.	Chassis
	2. Cut-off PASS TRANSISTOR (check Section III.)	Chassis
VI. Intermittent Operation		
	1. THERMAL SWITCH turns unit off. Ambient temperature is too high. Ports are blocked by external object.	Chassis
VII. Output Voltage Not Regulated This is usually accompanied by either too high or too low output voltage.		
	1. PASS TRANSISTORS shorted from emitter to collector.	Chassis
	2. Open VOLTAGE CONTROL pot (R209).	Chassis
	3. Blown fuse (F1). (If fuse blows repeatedly, voltage control pot (R209) or 470 ohm resistor (R7) may be shorted.)	Ctrl. unit (Tram) and Chassis
	4. Broken signal path through COMPARISON AMPLIFIER, PRE-DRIVER or DRIVER TRANSISTORS. (See Section I and II.)	Ctrl. unit (Tram) and Chassis
	5. See NOTE 3.	
VIII. Regulation Goes Out of Spec.	Defective transistor or resistor in the control unit.	
	1. Different voltages from those indicated on control unit schematic.	Ctrl. unit (Tram)
	2. Different voltages from those indicated for auxiliary supplies on power unit schematic.	RB-2
	3. Defective Zener diode RD-1.	Ctrl. unit (Tram)
IX. High Ripple Or Poor Transient Response		
	1. Open capacitor C206 or C502.	Chassis or RB-3
	2. Check Section VIII.	
X. Oscillation And Unstability		
	1. Capacitor C201, C301 or C501 is defective.	Chassis, RB-1 or RB-3
	2. Check Section VIII.	

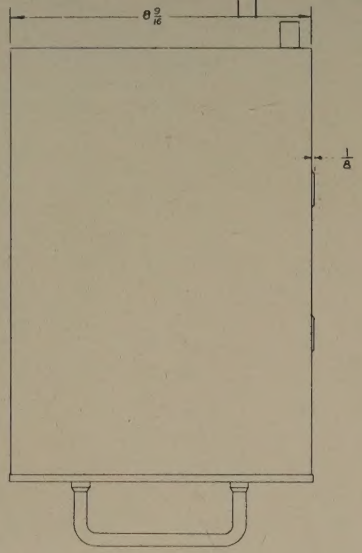
NOTES:

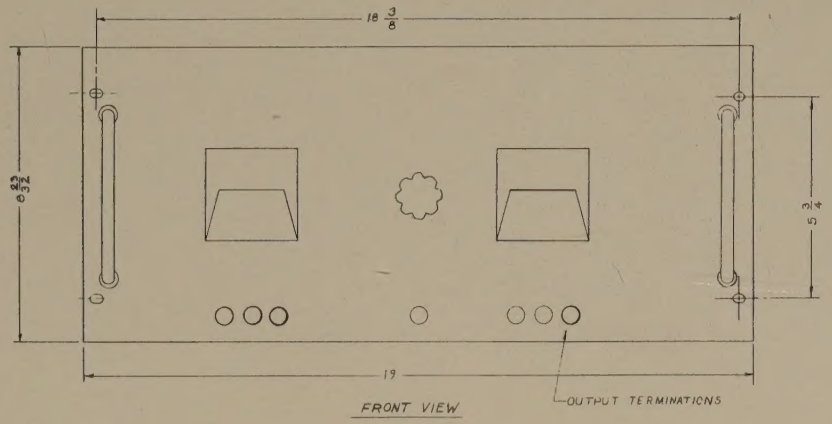
1. The output voltage may be varied within narrow limits by means of R18 which is located on the control unit. This enables the operator to adjust the output voltage to zero, if a change of parameters occurs in the COMPARISON BRIDGE. Turning the set screw CW will increase the output voltage; turning it CCW will lower the output voltage.
2. If transistors are tested, they should be pulled one at a time.
3. If the bus bars between the OUTPUT and the ERROR SENSING are disconnected and the remote load is not connected as per page C-2, output will not be regulated.
4. A good quality 20,000 ohm per volt VOM should be used on all voltage measurements. A good quality transistor checker should be used in all transistor measurements.
5. If a fuse blows repeatedly make a visual inspection of the unit.

CM00291

REVISIONS	DRAWN	CHKD.	APPD.	DATE







NOTE:-
USED ON MODELS:
SM-14-30
SM-36-15
SM-75-8
SM-160-4
SM-325-2

KEPCO INC.
FLUSHING, N.Y.

TITLE: OUTLINE DRAWING

DRAWN	CHECKED	APPROVED	DATE
TD	JPK		4-1-60
MODEL NO. SM 8-3/4 SERIES		PART NO.	SCALE
DWG. NO. CM00593			

TOLERANCE UNLESS OTHERWISE SPECIFIED: FRACTIONS ± 1/64 DECIMALS ± .005 ANGLES ± 1/2°

DEFIANCE NO. 19001H 49613

Kepco inc.

KEPCO, INC. • 131-38 SANFORD AVENUE • FLUSHING 55, N. Y. • IN 1-7000